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ABSTRACT

The usefulness of L. Guttman's partial order scalogram analysis is investigated in this study of the structure of a set of items that measure attitudes toward legal abortion. These items, drawn from the National Opinion Research Center's "General Social Survey," have been the focus of considerable applied research investigating predictors of attitudes toward abortion. The data constitute a probability sample of non-institutionalized adults in the contiguous United States. The abortion item includes seven possible situations for which the respondent is to choose whether or not an abortion should be legal. Since the survey items bear some of the characteristics of a perfect scale, they are also useful in demonstrating applications of theoretical research aimed at extending Guttman's model to include response patterns not defined by the original scalogram model. Prior to describing the experimental methodology, three models developed to incorporate non-scale response patterns into the scalogram model are summarized as a contrasting background for the Guttman approach. For each of the 7 years of data analyzed in the study proper, a two-dimensional POSAC-I (Partial Order Scalogram Analysis with Base Coordinates) space fit the data quite well, indicating that the responses of those surveyed do not support the hypothesis of a single order among attitudes toward reasons for legalized abortions. Using this ordinal factor analysis it was possible to determine the structure of the abortion scale items. One table, one figure, and 26 computer-generated scalograms are provided. (TJH)

TWO-DIMENSIONAL SCALOGRAM ANALYSIS: ANALYZING THE SCALABILITY OF ATTITUDES TOWARD ABORTION

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The importance of the notion of Guttman scaling in applied and theoretical research in the social sciences has been well documented for several decades (Edwards, 1957; Torgerson, 1958) and continues to be evident in numerous areas including investigations of the scalability of particular content areas and the development of theoretical measurement models. Despite the prevalence of the notion of Guttman scaling both in applied and theoretical settings, difficulties surrounding the use of Guttman's model are common due to the fact that so-called perfect scales are rarely found empirically.

In some respects, difficulties in identifying scalable content areas should come as no surprise. From the inception of his notion of cumulative scales, Guttman (1944, 1950) acknowledged that in practice perfect scales are found only rarely, if ever, because most content areas are too complex for data to be adequately represented by a single dimension. Recognizing the need for a more complex model even while developing his unidimensional model, Guttman (1954, p. 398) stated that "The coefficient of reproducibility was designed largely to help distinguish between those data which we knew how to handle and those which we did not as yet know how to handle." In recent years, Guttman extended his model for scalogram analysis to "handle" data other than those prescribed by a single cumulative ordering of items. The multidimensional extension, known as partial order scalogram analysis (cf. Shye, 1985), was stimulated by Birkhoff's (1948) work in abstract algebra, particularly the notion of a lattice for systematically investigating relationships among partly ordered sets.

The purpose of the present research was to investigate the usefulness of Guttman's partial order scalogram analysis for analyzing the structure of a set of items that measure attitudes towards legal abortion. These items, drawn from the National Opinion Research Center's *General Social Survey*, have been the focus of considerable applied research investigating predictors of attitudes towards abortion. Also, because these items bear some of the characteristics of a perfect scale,

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they have also been used to demonstrate applications of theoreical research aimed at extending Guttman's model to include response patterns not defined by the original scalogram model.

Like the motivation behind some of the theoretical research involving the abortion items, Guttman's motivation for developing a multidimensional scalogram model came from the need to incorporate a greater range of response patterns. However, Guttman's approach to extending his original scalogram model differs considerably from extensions proposed by others. Three models which have been developed around the question of how to incorporate non-scale type response patterns into the scalogram model will be summarized briefly so that the approach taken by these models might be contrasted with Guttman's approach. Though a large number of models for extending Guttman's scalogram model have been proposed, the rationale for discussing only these three particular models is that they are frequently referenced in the literature describing generalizations of Guttman's model and because they are based on a common premise which sharply distingushes them from the extension proposed by Guttman.

THEORETICAL FRAMEWORK

MODELS FOR EXTENDING GUTTMAN'S SCALOGRAM MODEL. Of the three models to be discussed, Proctor's (1970) model was the earliest to be developed. Proctor proposed a probabilistic generalization of the deterministic scalogram model in which he assumes that non-scale types result from statistically independent measurement errors associated with various items comprising a scale. The probability of erroneously responding to an item is assumed to be an unknown constant across all items and all subjects. Proctor proposes a method for estimating and testing a one-parameter model where the parameter of interest, α, represents measurement error. When the magnitude of α is small, a set of items is judged to be scalable, and in the extreme case where α reaches zero, Proctor's model reduces to Guttman's model.

A model proposed by Goodman (1975) differs somewhat from Proctor's. Goodman assumes that respondents belong to one of two subpopulations: scalable individuals whose responses to scale items are error-free and *problematic* individuals whose responses are random. Random responses may or may not contain error, but regardless, they exhibit no pattern. Goodman's model allows for what he calls multiform scales wherein items can take on multiple orders, each corresponding to a different segment of the population of respondents. This is in contrast to Guttman's original model which permits only a single scale pattern whereby scale items are ordered by "difficulty" and the order remains uniform across all respondents. Though Goodman's model allows for multiple orders, only one of these orders is considered a Guttman scale and all others represent unscalable subsets of the population of respondents. Goodman's

formulation includes the specification of models which can be fitted to empirical data for the purpose of estimating proportions of "intrinsically scalable" and "intrinsically unscalable" respondents in a population.

The third model to be described is one developed by Schwartz (1986). In essence, under this model, persons whose responses are non-scale types are assigned to the scale position of the scale type that their "inconsistent" response pattern most nearly resembles. The "nearness" of a non-scale type to a scale type is determined on the basis of various response errors and their associated probabilities. Schwartz's model includes a method for estimating the distribution of measurement errors, and from this distribution, the scale position to which a non-scale type most likely belongs can be determined.

The models proposed by Proctor, Goodman, and Schwartz have in common a characteristic which sharply distinguishes them from Guttman's extension of his original scalogram model. Each of these models appears to assume that scalability holds, unless there is overwhelming empirical evidence to the contrary, and that non-scale types, however prevalent or rare, reflect error--measurement error, intrinsically unscalable subsets of a population, or inconsistent responses--and from this stance, feasible ways of dealing with "error" are developed. None of these models allow for the possibility that *systematic* variation in a population of respondents could generate the so-called non-scale type profiles.

The assumption of scalability is prevalent, not only in these three theoretical models but in much applied work as well, despite the fact that Guttman's (1941, pp. 149-150) description of his original scaling model explicitly states that scalability is a hypothesis for a universe of items, for a given population at a given point in time, and that the scalability hypothesis must be repeatedly submitted to empirical tests. Repeated testing of the scalability hypothesis is important because it serves to establish the existence of a scalable content area and because if perfect scales exist at all, they are subject to change across populations of individuals and across time. Items found to be scalable for one segment of a population of respondents may not be scalable for another segment whose experiences give them an understanding of the content area which differs from that of their cohorts, and items which form a scale for one population may scale differently for another population. Scalability is also affected by time: a set of items found to scale at one period in time may not scale at a later time. In any case, Guttman clearly states that scalability must be tested empirically, and replication is essential for establishing the existence of a scalable content area.

To emphasize the fact that scalable areas are rare and that scalability cannot be assumed, Guttman (1977, especially Problem 4 and points No. 33 and 36) emphatically and clearly points out that the proper null (and incumbent) hypothesis in tests of scalability is one of multidimensionality, and the alternative (challenging) hypothesis is scalability. Assigning scalability the role of the challenging hypothesis follows from the logic that characterizes all hypothesis testing: common occurrences--not rarely observed phenomena--give rise to incumbent hypotheses, and only in the face of considerable empirical evidence should the challenging hypothesis be accepted over the incumbent. Practices such as assuming a universe is scalable or "throwing away" items which do not scale in order to "construct" a scale is, in Guttman's view, like "ignoring evidence that the world is round" (p. 100). The fundamental purpose of scale analysis, in the Guttman tradition, is to investigate the structure of the *entire* content universe--not subsets of this universe--by examining interrelationships among qualitative (categorical) observations (Guttman, 1945).

Given the prevalence of content areas found to be unscalable, Guttman's approach to "handling" non-scale types was to develop a multidimensional scalogram model that incorporated all scale types by viewing them, not as the product of error, but as scale types representative of a subset of the population which differed in systematic ways from other subsets of respondents.

PARTIAL ORDER SCALOGRAM ANALYSIS. Partial order scalogram analysis grew out of Guttman's efforts to understand the structure of response patterns when a content area was too complex to be considered cumulative, giving rise to a considerable number of so-called non-scale types. The multidimensional model he proposed assumes that empirically observed non-scale types are due to a departure of the structure of the content area from unidimensionality, and no distinction is made between departures due to random error and departures due to systematic differences among subsets of the population of respondents.

The notion of partial order provides a framework for representing similarities and differences among all empirically observed profiles. Partial order relations can best be illustrated by considering a collection of profiles composed of responses to items--attitude measures, for example--where the response categories of all the items have a common direction (e.g., negative to positive) and where the items collectively measure of common construct (e.g., attitudes toward legal abortion). When these two conditions are met, the items are said to have a *common range*, and a rationale exists for comparing individuals with respect to the *degree* and *type* of behavior their responses are thought to indicate.

Comparisons of profiles on the basis of degree and type of attitude require an understanding of two concepts: *comparable* and *noncomparable* relationships. Comparability refers to the situation where, in some sense, one profile is greater than another. A profile p_a is considered greater than another profile p_b if p_a is greater than p_b on at least one item and equal to p_b on all other items. Under these conditions, the two profiles are said to be *comparable* and $p_a > p_b$. If p_a is neither greater than nor less than p_b across the entire response string, the profiles are *noncomparable*. Noncomparability exists between two profiles p_a and p_b if and only if p_a has a greater rank on at least one item while p_b is greater on at least one other item. Collectively, the notions of comparability and noncomparability are sufficient for describing relationships between all possible pairs of profiles generated from items having two or more response categories.

To illustrate comparable and noncomparable relationships, consider the profiles of seven persons in response to four dichotomous items as shown in Table 1. In the sense of partial order relations, profiles of persons E, C, B, D, and A are mutually comparable because $p_e > p_c > p_b > p_d > p_a$. For example, $p_e > p_c$ because p_e has a higher rank on the fourth item $(2 > 1)$, while the two profiles have equivalent ranks $(2=2)$ on the first, second, and third items. Profiles of persons G and B, on the other hand, are noncomparable because on the first item, $p_g > p_b$ $(2 > 1)$ while on the second item $p_g < p_b$ $(2 < 1)$.

Table 1 about here

To identify properties underlying the partial order structure of a collection of observed profiles it is helpful to portray the profiles in a geometric space called a *Hasse diagram*. A Hasse diagram, which is a special case of a lattice structure in abstract algebra, represents unique profiles as distinct points in an n-dimensional space where two points are connected by a line if and only if they represent comparable profiles.

For a given set of dichotomous items, where *n* represents the number of items, the maximum number of observable unique profiles is given by 2^n, and a Hasse diagram in *n* dimensions would be required to correctly portray all the partial order relationships among the entire set of profiles. In applied work, where items from a common content universe generally bear a certain degree of similarity in content, the number of observed profiles tends to be less than the total number possible. Some combinations of responses are not likely to occur in practice because they represent contradictory atttitudes. To the extent that fewer than 2^n unique profiles are observed, the number of dimensions required for portraying the partial order can be considerably

fewer than *n*. The case where n+1 mutually comparable profiles are observed is a traditional Guttman scale, and only a single dimension is required for portraying the order relations among these profiles. When noncomparable profiles are observed, a minimum of two dimensions is required.

Figure 1 about here

Figure 1 gives a two-dimensional Hasse diagram which portrays the partial order relations among the seven profiles in Table 1. As shown in this figure, a Hasse diagram rank orders profiles on the basis of the sum of the category ranks from each item. Profile p_e, with response string "2222" and a rank sum of 8, has the highest rank; profile p_a ("1111") with a rank sum of 4 has the lowest rank, and all other profiles are intermediate. The diagram also shows that some profiles have equal rank sums, but these ranks result from distinct profile patterns. For example, the profiles "1121" and "2111" both have a rank of 5 indicating equivalent degrees of some behavior, but because the profiles are mutually noncomparable, they reflect types of behavior that differ qualitatively.

PARTIAL ORDER SCALOGRAM ANALYSIS WITH BASE COORDINATES. Partial Order Scalogram Analysis with Base Coordinates (POSAC-I) is a computer program from the Guttman-Lingoes series (Shye & Amar, 1985) for portraying partial order relations in a two-dimensional space.[1] The initial subroutine of POSAC-I makes a listing of the distinct profiles in a data set and records their observed frequency. Unlike traditional scalogram analysis, POSAC-I does not require that items be ordered in terms of their "difficulty" prior to analysis. With partial order scalogram analysis, many possible orders among the items can exist, each order corresponding to a different segment of the population of respondents.

POSAC-I represents distinct profiles in a two-dimensional space which preserves their partial order relations by, in effect, mapping a Hasse diagram onto the two-space. A restriction

[1] The restriction to two dimensions is due to the fact that computer algorithms for higher-dimensional configurations have not yet become available. At the time of his death, Guttman was working on algorithms for a three-dimensional solution which he felt were considerably more complex than algorithms for solutions in fewer dimensions. Even while continuing to work on the three-dimensional solution, Guttman (personal communication, Oct. 1987) noted that for a wide range of diverse content areas two-dimensional partial orders seemed to suffice for summarizing the structure of the content area.

called **regionality** is also imposed on the solution. Regionality requires that for as many items as possible, each item considered separately, points representing profiles of persons who respond identically to a particular item are located close together in the geometric space so as to form a topological region. For example, given a dichotomous item, profiles of all persons who rank high on the item will be represented by points which are in close proximity to one another and, thereby, form one region. Persons who rank low on that same item will be represented by points in an adjacent but distinct region. Ideally, each response category corresponds to a region, and regions in a solution space are separated by boundary lines that are free to take on any shape. The rationale for the regionality requirement is that all persons who respond similarly to an item should occupy similar positions in the structure of the overall solution space.

A goodness-of-fit index, CORREP, represents the proportion of partial order relations correctly represented in A POSAC-I solution, given the regionality constraint. In generating a solution space, POSAC-I attempts to minimize CORREP by first calculating mathematically optimal X- and Y-coordinates for profiles having the highest observed frequencies and only later solving for the coordinates of profiles observed less frequently. Minimizing CORREP in this way implies that frequently observed profiles play a greater role in determining the solution space than do profiles observed less frequently.

POSAC-I output consists of a single space diagram and a set of item diagrams corresponding in number to the items under consideration. Figure 2 illustrates POSAC-I output for the profiles in Table 1. In the space diagram shown in Figure 2a, each unique profile is represented by a point labeled with a subject identification number, and the ordering of the points reflects the partial order relations among the profiles. Essentially, the space diagram is a Hasse diagram rotated 45 degrees so that profiles having the highest rank occupy the northeast quadrant and profiles with lower ranks fall to the southwest. The northeast-to-southwest direction is called the **joint direction**, and it orders profiles according to levels or degree of the behavior being measured. When a two-dimensional POSAC-I configuration fits the data, the positions of all profiles with respect to the joint direction correctly reflect their ranks. The meaning of the joint direction of the solution space comes from the common range that the items jointly measure. The joint direction is sufficient for ordering the profiles only when items represent a cumulative behavioral universe.

Figure 2 about here

When items represent behaviors that vary qualitatively as well as quantitatively, a second dimension is required for portraying relationships among profiles. This direction, called the **lateral direction,** is represented in the solution space by the diagonal running northwest-to-southeast, and it corresponds to qualitative aspects of behavior. Profiles which have the same rank sum but are noncomparable are spread in the lateral direction. The orthogonality of the lateral and joint directions reflects the notion that **degree** and **type** of behavior are properties which are free to vary independently of one another.

Figures 2b-2e are item diagrams for four dichotomous items. The locations of points in item diagrams is identical to that in the space diagram, but labels on the points differ. Item diagrams are labeled so as to represent the score from each profile on each item separately. For example, Figures 2b-2e show that person B chose the response category with the lowest rank (i.e., rank "1") for items 1 and 4 while choosing the highest category rank for items 2 and 3. The dotted lines in the item diagrams are drawn in the researcher, and they represent boundaries between regions corresponding to the item's response categories.

Items having category boundaries that run parallel to the X- and Y-axes (as in Figures 2b and 2c, for example) are called X- and Y-base items, and they are said to play basic roles in structuring the content universe. Base items need not always be found in an empirical solution, but when they do exist, the content of these items represents orthogonal conceptual components that underly the content universe.

To represent the position of a profile relative to the base items, POSAC-I computes a pair of base coordinates for each profile. In this way, the position of each observed profile is noted with respect to the basic orthogonal concepetual components that define the multidimensional scalogram space. Whereas rank order is sufficient for conveying all of the information contained in a profile in unidimensional scalogram analysis, two coordinates--the base coordinates--are sufficient for summarizing the information contained in a multivariate profile when two dimensions are needed for portraying partial orders among profiles.

One of the benefits of knowing that a behavioral universe is scalable, in the sense of traditional Guttman scales, is the great parsimony a "perfect scale" provides for problems of prediction. Guttman (1950) showed that when a universe is scalable, prediction of an external criterion variable from a single variable (rank order) is as accurate as prediction from the entire multivariate profile. The benefits of partial order scalogram analysis are analagous. When a two-

dimensional POSAC-I solution adequately accomodates a set of profiles, the same parsimony is achieved except that in place of a single score, two scores--the base coordinates from POSAC-I--correlate with an external variable to the same degree as the entire multivariate profile.

HYPOTHESIS

The general hypothesis being tested in partial order scalogram analysis can be stated thus: given items with a common range which generate a partial order with respect to a well-defined content area, there will be some item which will be purely in one base direction, another in another base direction, and all other items will be functions of these base items. The present study used partial order scalogram analysis to investigate the stucture of a set of seven dichotomous items measuring attitudes towards legalized abortion. The specific hypothesis being tested was that while attitudes toward abortion, as measured by a specific set of items, represent a content universe too complex to form a Guttman scale, a two-dimensional structure would suffice for representing relationships among the profiles generated from responses to these items. Further, the partial order structure of the profiles generated from these items was expected to facilitate identification of basic conceptual components of the content area.

METHOD

DATA

Data for this investigation were responses of the National Opinion Research Center's (NORC) probability sample of non-institutionalized adults in the 48 contiguous States who answered each of seven items measuring attitudes toward legalized abortion . The responses from each of seven years following the Supreme Court's decision to legalize abortion--1977, 1978, 1980, 1982, 1983, 1984, and 1985--yielded sample sizes of 1,347; 1,345; 1,268; 1,379; 1,365; 1,294; and 1,357 respectively. Data from each of these years were submitted separately to POSAC-I for analysis.

INSTRUMENT

Items used in this investigation were seven dichotomous measures of attitudes towards legalized abortion drawn from the NORC's *General Social Survey* (Davies & Smith, 1985). Across all years when data were collected, the items were administered to all respondents in a uniform order, shown below. The seven questions have a common stem which reads, "PLEASE TELL ME WHETHER OR NOT YOU THINK IT SHOULD BE POSSIBLE FOR A PREGNANT WOMAN TO OBTAIN A LEGAL ABORTION IF..." The stem is followed by seven statements, and individuals are asked to respond "YES" or "NO" to each. The statements read as follows:

a. If there is a strong chance of serious defect in the baby?
b. If she is married and does not want any more children?
c. If the woman's own health is seriously endangered by the pregnancy?
d. If the family has a very low income and cannot afford any more children?
e. If she became pregnant as a result of rape?
f. If she is single and does not want to marry the man?
g. If the woman wants it for any reason?

In typical uses of these items, respondents are given one point for each of the seven questions to which they answer affirmatively.

The seven abortion items are often combined to form a single measure, and in many instances they are treated as a Guttman scale. For each of the years under consideration, the reproducibilty coefficients for the measure in were found to vary only slightly with values ranging from a low of 0.9354 in 1978 to a high of 0.9448 in 1984. Despite the high values of these coefficients, often the abortion items are conceptualized as two distinct subscales: items b, d, f, and g are regarded as "soft" discretionary reasons for approving of legalized abortion while items a, c, and e are thought of as "hard" reasons related to medical emergencies. Some researchers treat the two subsets as separate Guttman scales (e.g., Harris & Mills, 1985), while others note the differences in content of the two subsets but then assign respondents a single summary score for all of the items combined (e.g., Arney & Trescher, 1976).

RESULTS

For each of the years examined, a two-dimensional POSAC-I space fit the data quite well. (The values of CORREP ranged from 0.95 to 0.98.) The goodness-of-fit implies that order relationships among the unique profiles observed each year were accurately portrayed in two dimensions. Of the 128 unique profiles that are theoretically possible, the number of distinct profiles actually observed from 1977 to 1985 fell far short of this number and varied only slightly, ranging from a low of 42 in 1983 to a high of 57 in 1977. Among the profiles observed in any of these years were the eight profiles generally held to represent the Guttman scale-types for these items. These "scale types" accounted for approximately 80% of all the observed profiles in any one year.[2] Of the remaining 20%, some profiles were observed only once in a given year and others were observed considerably more frequently.

[2] In the context of partial order scalogram analysis, the term *scale type* is ambiguous because a partial order structure contains many orders, each of which is a "Guttman scale." For example, for the profiles in Figure 1, profiles E, C, G, F, and A form a Guttman scale when Items 2 and 3 are

In addition to showing the diversity of observed profiles across any one year, POSAC-I output showed the diversity among types of profiles at each rank level across the eight possible rank orders for seven items. For a set of seven dichotomous items, the number of theoretically possible distinct profiles at each rank-level is given by the coefficients of the binomial $(a + b)^7$. Thus, for example, the theoretical number of distinct profiles, each having a rank of 4, is given by the coefficient of the fourth term of the binomial and has a value of 35. Again, the theoretical number of possible profiles at each level in the rank order was found to greatly exceed the number actually observed. At no rank level, however, was the homogeneity so extreme that only a single scale-type was observed. Were it true that the order relations among the observed profiles represented a perfect Guttman scale, not only would the number of distinct observed profiles be fewer than the number theoretically possible, but at each rank level, only a single scale type would be observed.

The heterogeneity of the observed profiles, in terms of both degree and type of approval of abortion, is evident in the spread of the profiles in the POSAC-I space diagrams shown in Figure 3. The profiles considered to be Guttman scale types by those who view the abortion items as a Guttman scale have been noted in the space diagrams in order to emphasize the loss of information that goes with considering these items to be cumulative.

Figure 3 about here

In each of the years examined, the data supported the hypothesis that particular items would act as X- and Y-base items and partition the axes into regions. The item diagrams for these base items accompany the space diagrams in Figure 3. As Figure 3 shows, the content of the items that played base roles varied to some extent across time. In 1977, for example, an item referring to abortion for reasons surrounding a woman's health corresponded to the X-direction of the solution space while the Y-direction corresponded to abortion for reasons dealing with limiting family size. In 1982, the X-direction was characterized by attitudes toward abortion when the baby was at-risk for serious defect, and the Y-axis was characterized by attitudes toward abortion when the family income was low. As the item diagrams show, in three of the seven years, the item having to do with the woman's health being endangered played a base role by partitioning the X-axis into

interchanged. Likewise, profiles E, C, B, D, and A form a perfect scale when items 1 and 3 are interchanged.

regions. In the four remaining years, items playing X-base roles were those citing rape and the chance of a serious defect in the baby as a reason for abortion. As for items whose regions partitioned the Y-axis, the item having to do with low income as a rationale for abortion played a base role in three different years, while items citing the desire to have no more children, to remain single and not marry the man, or to have an abortion for any reason were each found to be base items in at least one of the remaining years.

DISCUSSION

In general, the POSAC-I analyses of these abortion data show that responses of a nationally representative sample of U.S. adults do not support the hypothesis of a single order among reasons for legalized abortion. Guttman gave four criteria for a Guttman scale: reproducibility is one of these and the scatter of non-scale types (error) is another. While the reproducibility coefficients for these abortion data have been found to be consistently high, suggesting the possibility of a Guttman scale, the partial order structure of the profiles shows that several orderings of the abortion items are possible and that systematic relationships exist among the orders. This finding implies that the use of a single ordinal score to represent a respondent's attitude toward legal abortion does not sufficiently capture the information in these profiles. A method of scoring indiviuduals so as to reflect differences in degree as well as type of approval for abortion would more efficiently summarize the information in these multivariate profiles.

Noting the position of a profile relative to the joint and lateral directions of the POSAC-I solution space is useful for representing differences among observed profiles with respect to degree and type of approval for abortion. However, rather than assigning scores to a profile on the basis of its position relative to the diagonals of the solution space, it is possible to rotate the joint and lateral directions so as to obtain scores--base scores--that position a profile in the two-dimensional space relative to the X- and Y-axes. For each of the years examined here, the meaning of the axes can be derived from the content of items that partitioned the solution space in the X- and Y-directions. Thus, the information contained in each multivariate profile can be summarized in terms of the content of the X- and Y-base items.

Though the specific content of items playing X- and Y- base roles was found to vary across the seven years examined here, consistent findings emerged. The X-direction consistently corresponded to attitudes toward abortion for reasons having to do with uncontrollable health- and medical-related situations (the woman's health, rape, defect in the baby) while the Y-direction consistently corresponded to issues of financial and social (marital) status (having a low income, not wanting more children, being single, and abortion for any reason).

This analysis of the structure of the abortion items, which can be thought of as an ordinal factor analysis, provides evidence of two intrinsically orthogonal factors, and the X- and Y-base scores computed by POSAC-I for each profile can be viewed as factor scores. In factor analytic studies conducted by other researchers to determine the structure of these items, where principle components analysis with varimax rotation is typical, a two-factor solution in which the factors are essentially the X- and Y- directions identified here has been noted. By comparsion, a strength of the present analysis is that the data--qualitative (categorical) observations--were treated in their own right. Through examination of systematic characteristics of partial order relationships, which did not make unfounded demands on the data as is often the case with factor analytic studies, the structure of the abortion scale items could be determined.

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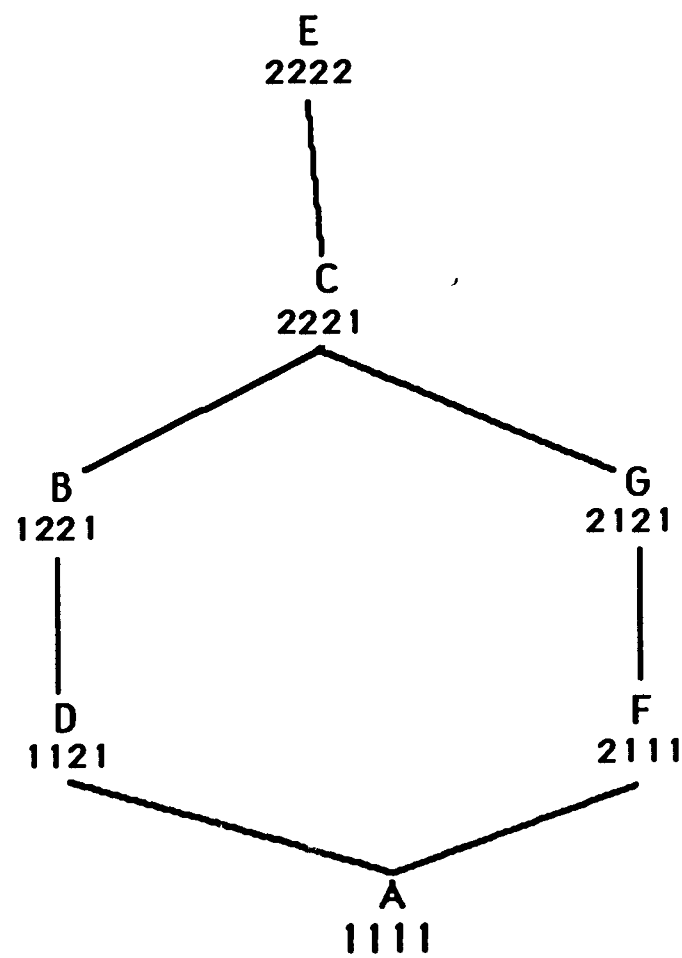
TABLE 1

Profiles of seven persons based on four dichotomous items

Person	Profile of Four Ranks	Profile Rank
A	1 1 1 1	4
B	1 2 2 1	6
C	2 2 2 1	7
D	1 1 2 1	5
E	2 2 2 2	8
F	2 1 1 1	5
G	2 1 2 1	6

FIGURE 1

Hasse diagram for seven profiles



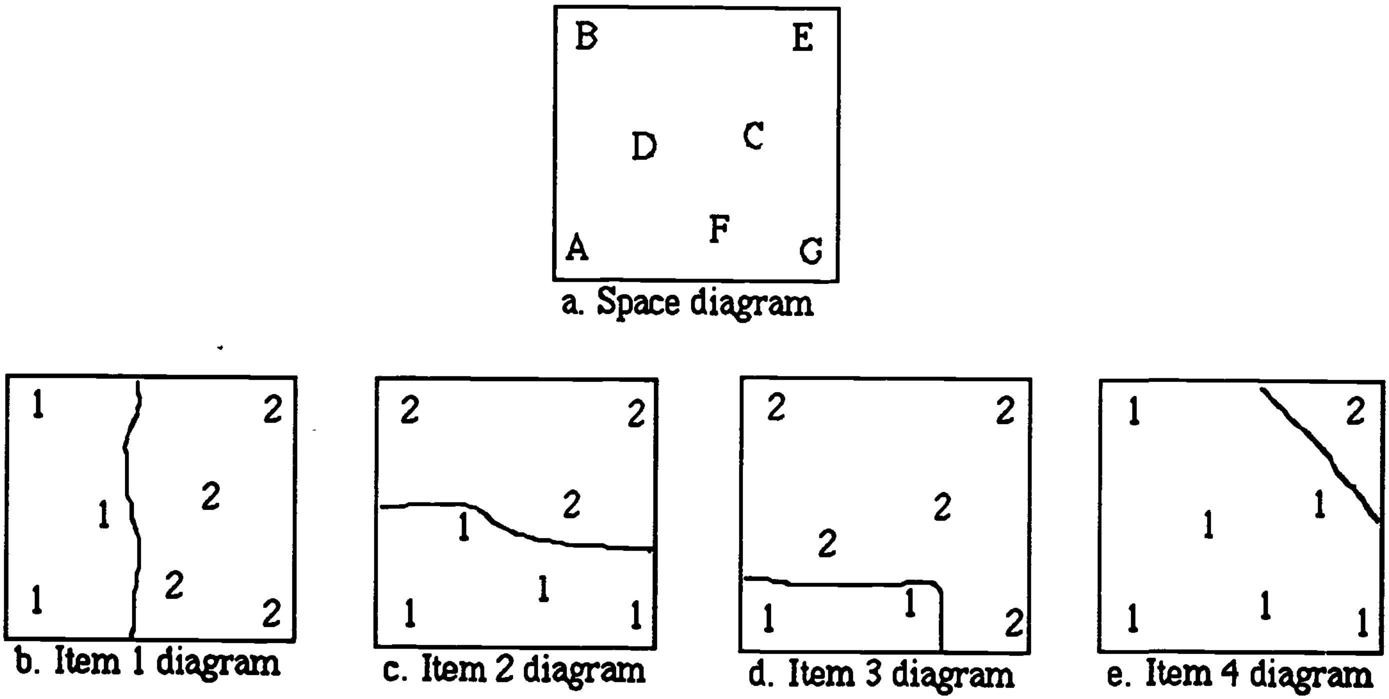
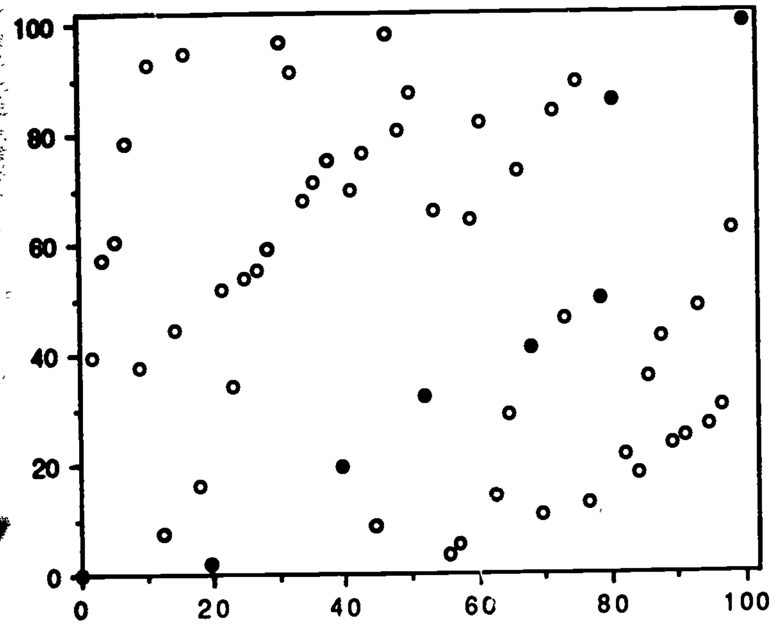


Figure 2. Example of POSAC-I space and item diagrams

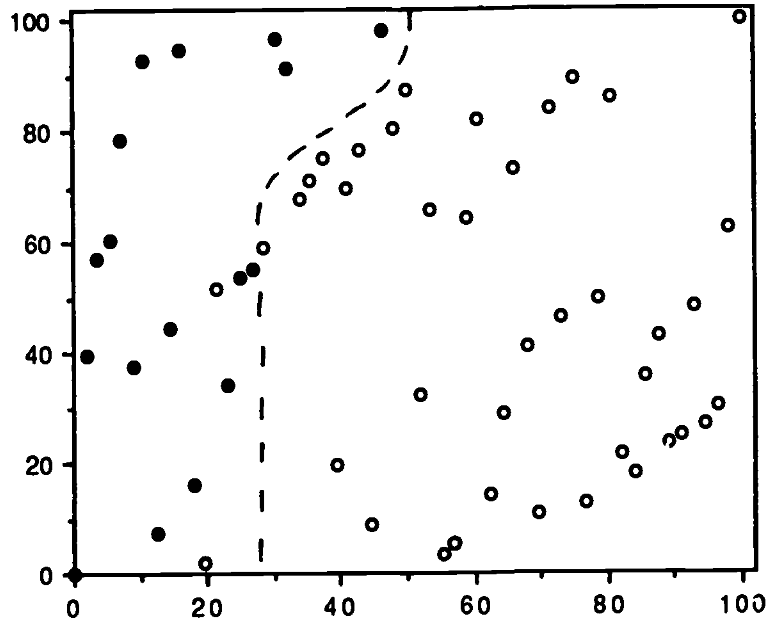
Figure 3. Space and item diagrams from POSAC-I output for abortion data from 1977 to 1985

Profiles on Abortion Items Observed in 1977 (N=1347)



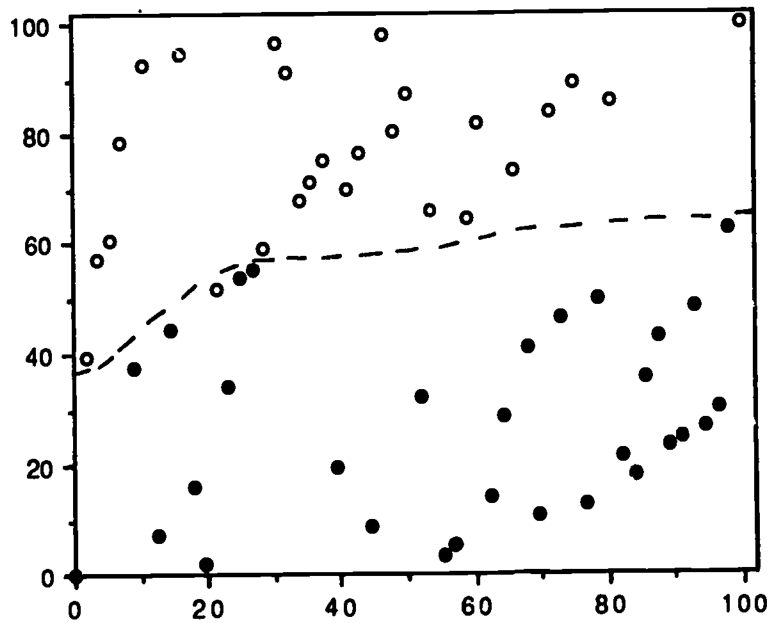
Space diagram for profiles observed in 1977

● Profiles of Guttman scale types



X-base item: WOMAN'S HEALTH ENDANGERED BY PREGNANCY

o Affirmative responses ● Negative responses

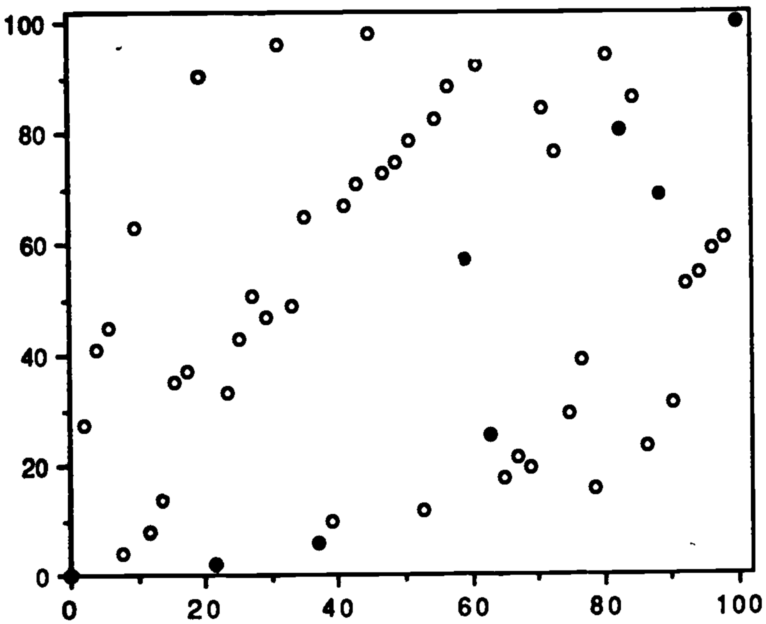


Y-base item: MARRIED AND DOES NOT WANT MORE CHILDREN

o Affirmative responses ● Negative responses

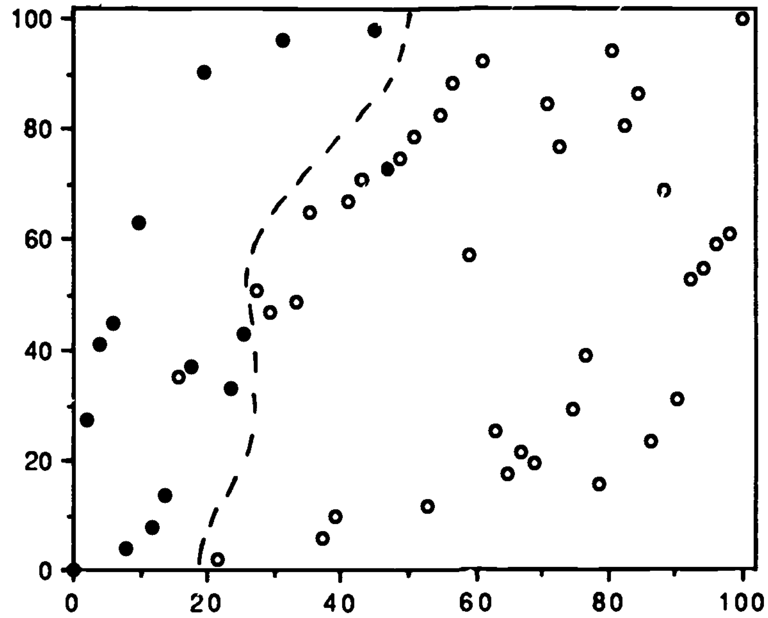
Figure 3 continued

Profiles from Abortion Items Observed in 1978 (N=1345)



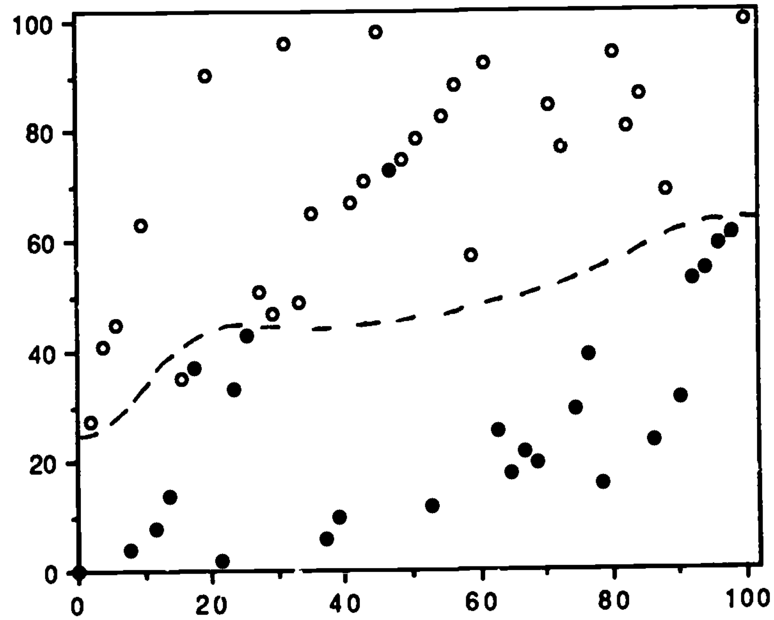
Space diagram for profiles observed in 1978

● Profiles of Guttman scale types



X-base item: WOMAN'S HEALTH ENDANGERED BY PREGNANCY

o Affirmative responses ● Negative responses

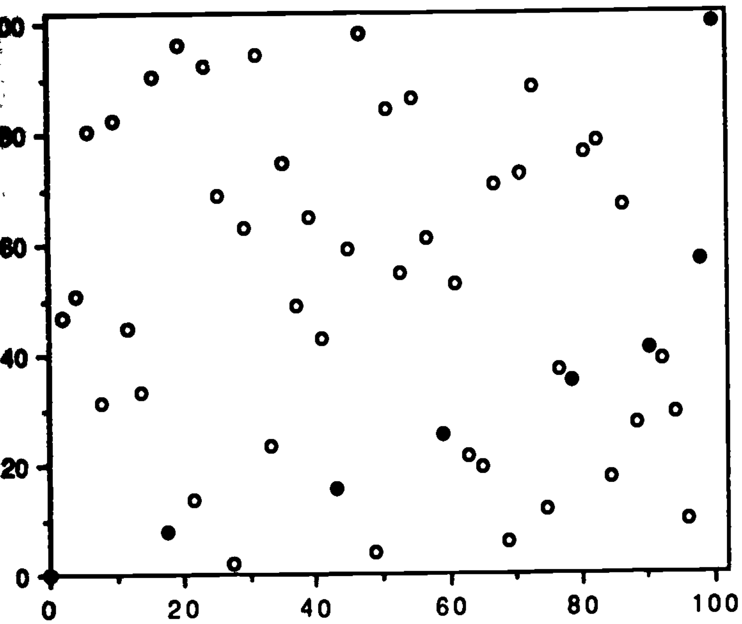


Y-base item: LOW INCOME AND CANNOT AFFORD MORE CHILDREN

o Affirmative responses ● Negative responses

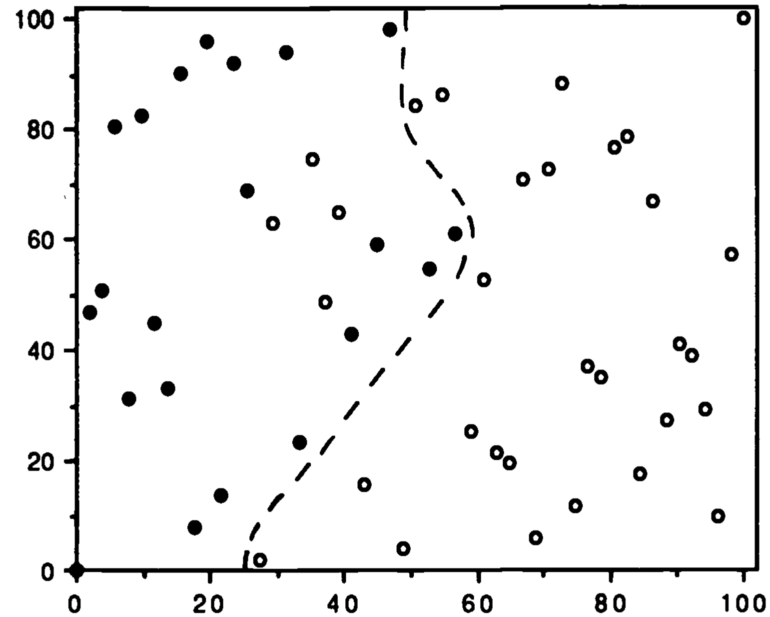
Figure 3 continued

Profiles from Abortion Items Observed in 1980 (N=1268)



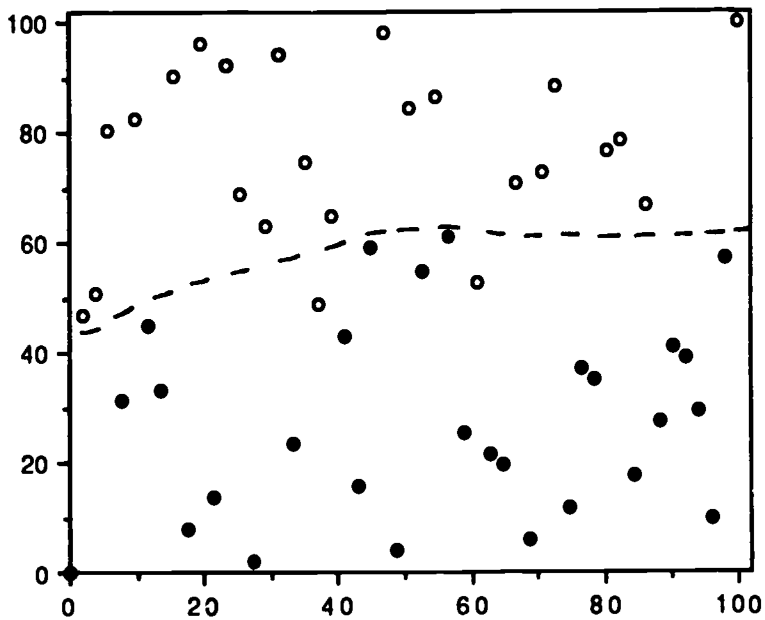
Space diagram for profiles observed in 1980

● Profiles of Guttman scale types



X-base item: PREGNANT AS A RESULT OF RAPE

O Affirmative responses ● Negative responses

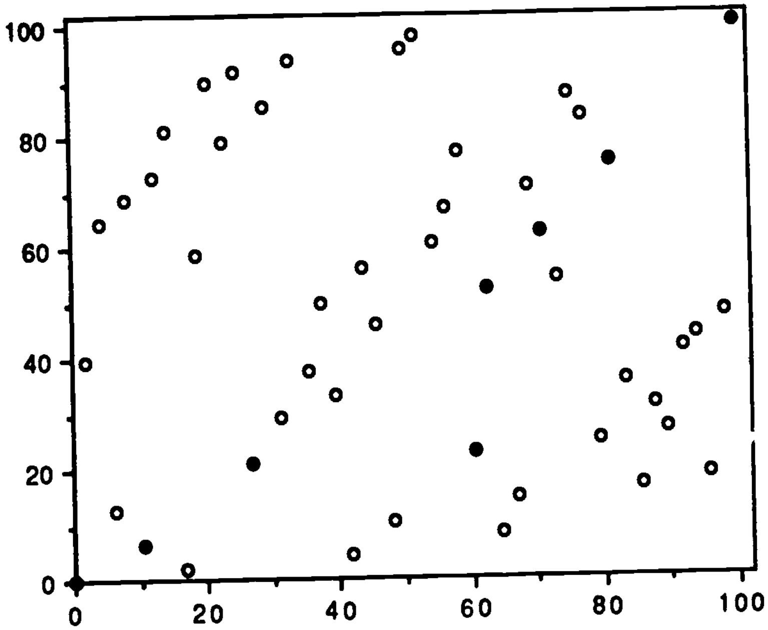


Y-base item: WOMAN WANTS ABORTION FOR ANY REASON

O Affirmative responses ● Negative responses

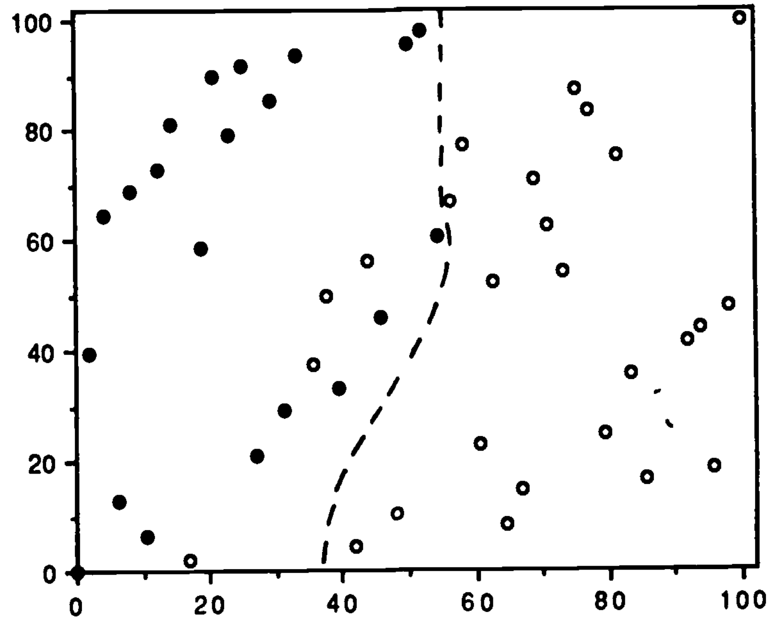
Figure 3 continued

Profiles on Abortion Items Observed in 1982 (N=1379)



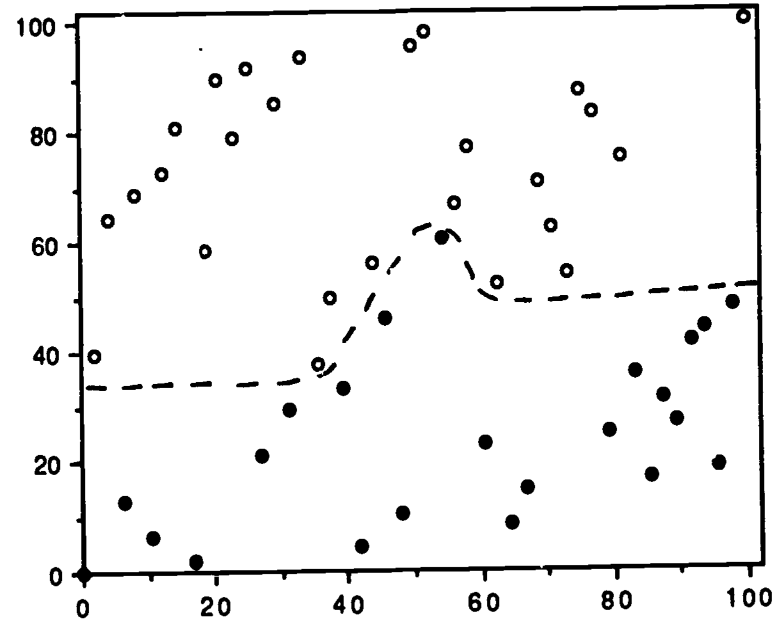
Space diagram for profiles observed in 1982

● Profiles of Guttman scale types



X-base item: STRONG CHANCE OF SERIOUS DEFECT IN BABY

o Affirmative responses ● Negative responses

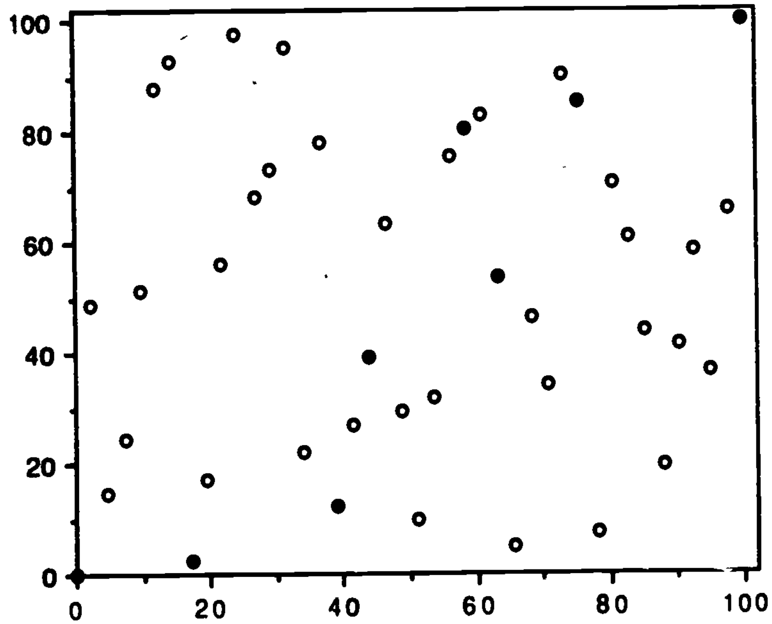


Y-base item: LOW INCOME AND CANNOT AFFORD MORE CHILDREN

o Affirmative responses ● Negative responses

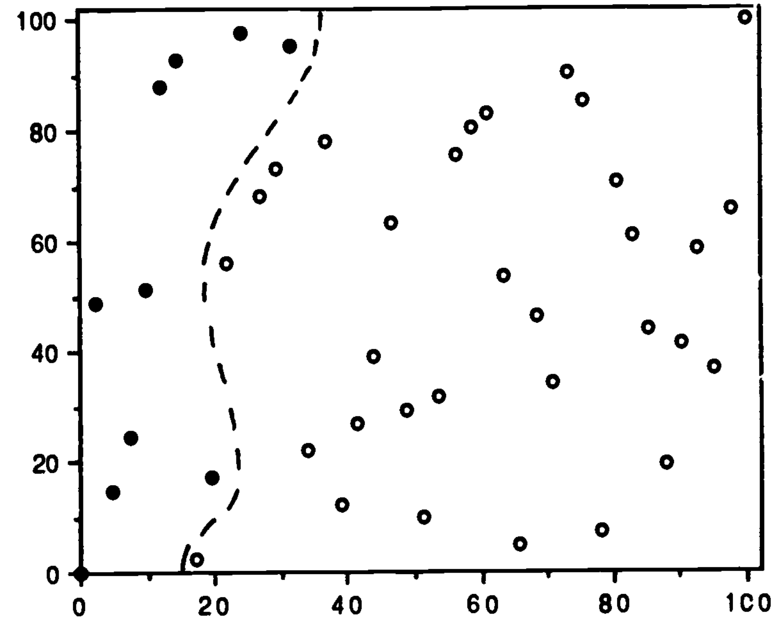
Figure 3 continued

Profiles on Abortion Items Observed in 1983 (N=1365)



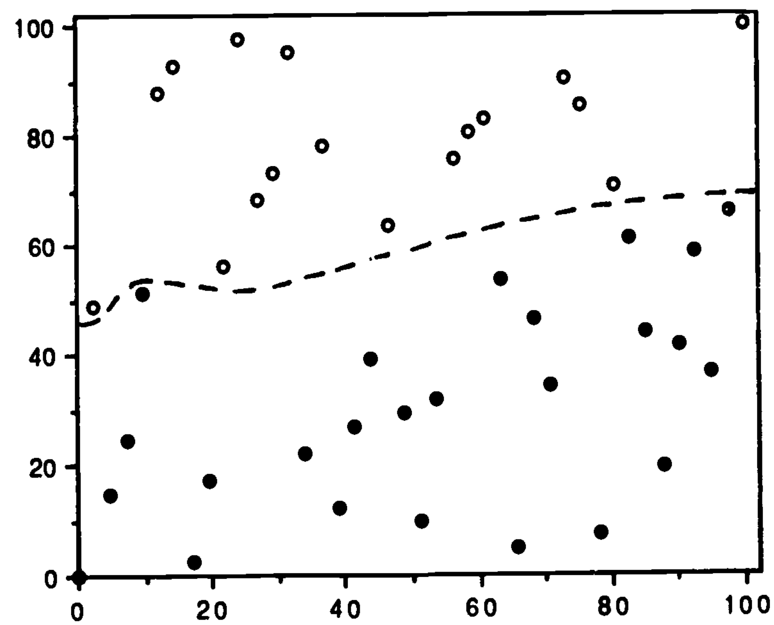
Space diagram for profiles observed in 1983

● Profiles of Guttman scale types



X-base item: WOMAN'S HEALTH ENDANGERED BY PREGNANCY

o Affirmative responses ● Negative responses

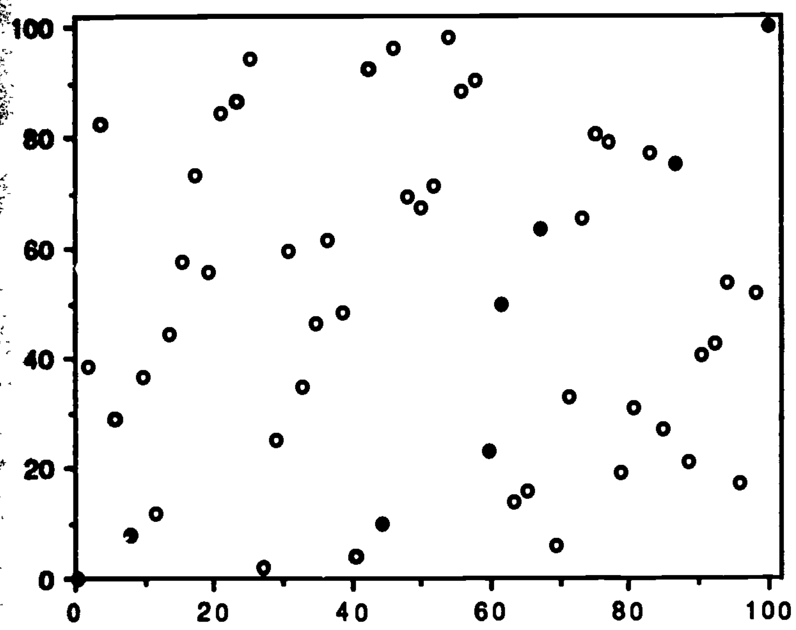


Y-base item: WOMAN SINGLE AND DOES NOT WANT TO MARRY

o Affirmative responses ● Negative responses

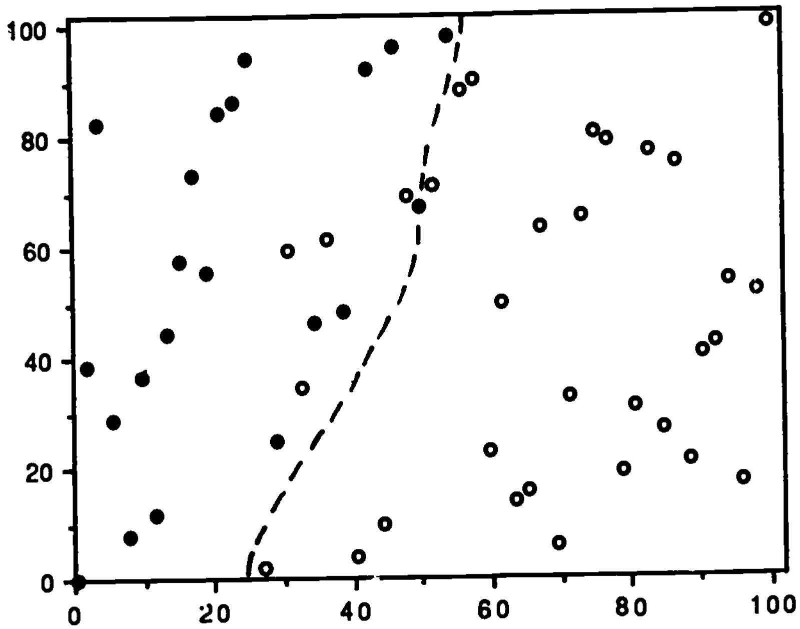
Figure 3 continued

Profiles on Abortion Items Observed in 1984 (N=1294)



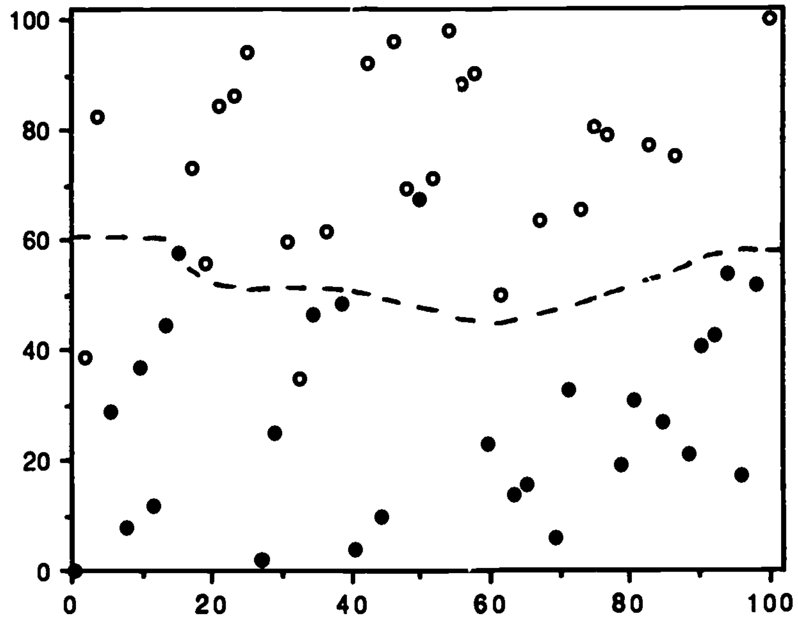
Space diagram for profiles observed in 1984

● Profiles of Guttman scale types



X-base item: PREGNANT AS A RESULT OF RAPE

o Affirmative responses ● Negative responses

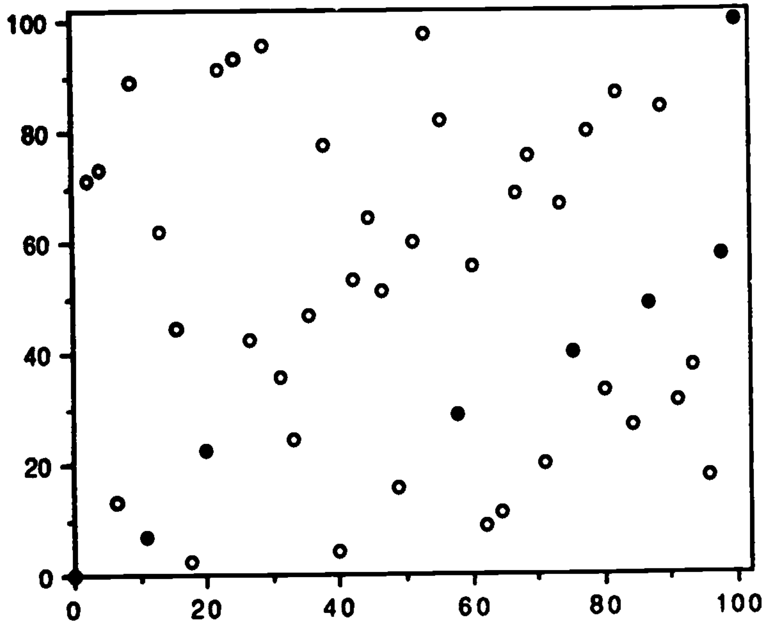


Y-base item: LOW INCOME AND CANNOT AFFORD MORE CHILDREN

o Affirmative responses ● Negative responses

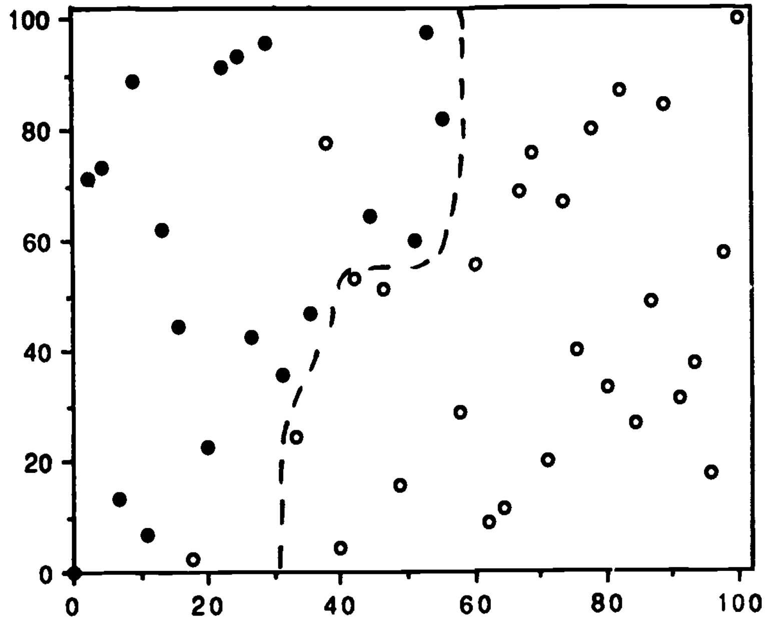
Figure 3 continued

Profiles on Abortion Items Observed in 1985 (N=1357)



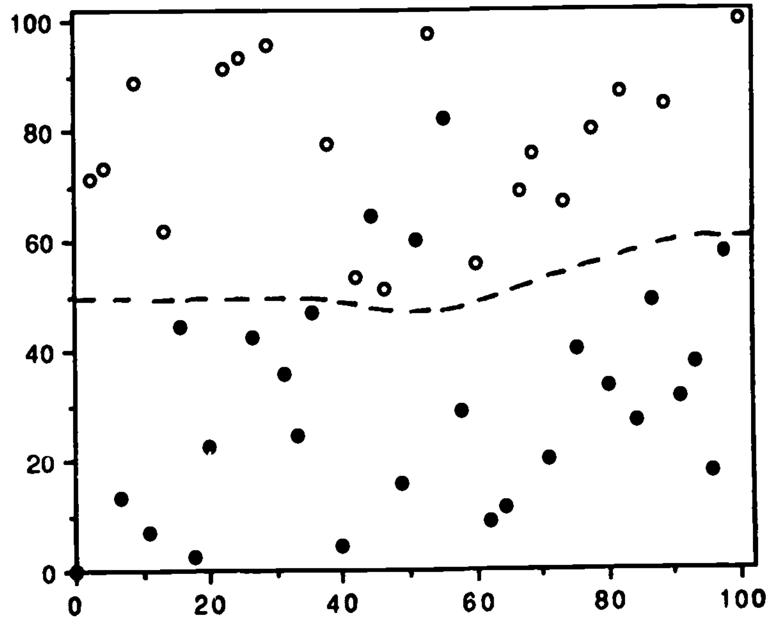
Space diagram for profiles observed in 1985

● Profiles of Guttman scale types



X-base item: STRONG CHANCE OF SERIOUS DEFECT IN BABY

O Affirmative responses ● Negative responses



Y-base item: WOMAN WANTS ABORTION FOR ANY REASON

O Affirmative responses ● Negative responses